THURSDAY, MAY 30, 1918.

GARDENING: OLD AND NEW.

The Standard Cyclopedia of Horticulture. By L. H. Bailey. In six volumes. Vol. v., P–R. Pp. v+2423–3041+plates. Vol. vi., S–Z and Supplement. Pp. v+3043–3639+plates. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1916–17.) Price 25*s*. net each vol.

THE excellence of Prof. Bailey's "Cyclopedia of Horticulture," the earlier volumes of which have already been noticed in these pages, is maintained in the fifth and sixth volumes, which have now appeared and arrived safely in this country. We can imagine no more interesting or stimulating reading for British horticulturists than the articles on subjects grown by them and also cultivated in America.

The differences of climate between the States and this country are reflected in the different horticultural treatment practised by European and American experts. Thus, in the case of the strawberry we find that in the southern districts of the United States it is the practice to take one crop only and then to discard the plants, whereas in our more moderate climate growers generally take three crops before ploughing up their plantation.

Again, as is to be expected in the case of so American a genus, the grape-bearing species of Vitis are treated of in a far more comprehensive manner than in any British cyclopædia; indeed, we confess to a glad surprise to learn that there are no fewer than thirty-six species of Vitis which bear edible grapes.

Here and there the British horticulturist will notice omissions, as, for example, the failure of the author responsible for the article on tulips to cite among the "literature" the admirable monograph of Mr. Dykes on that genus of plants.

The rapidly growing importance of California as a seed-raising country is strikingly illustrated by the statement in the article "Seed and Seedage" that the seeding acreage under lettuce, onion, and sweet-pea—most popular of flowers in America—is no less than 5000. In addition to these seed crops, America contributes large and increasing quantities of seed of the culinary pea, bean, cabbage, radish, and others; nevertheless, the American imports of garden seed alone are of the annual value of two million dollars.

Among the important genera described in these volumes are Primula, Prunus, Pyrus, Rosa, and Solanum, and each is dealt with in a thorough manner. It is noteworthy that, as admitted in the article on the potato, America, like ourselves, has awakened late to the great importance of this crop; Germany alone of all the great nations seems to have taken advantage of the fact that this plant is the most productive of all cultivated food plants. Whereas half the huge crop raised in Germany is used for food for stock or for commercial purposes, only 1 per cent. of the far smaller crop is similarly employed in America.

The treatment of *Primula sinensis*—that queen of flowers for glass-house cultivation—is too meagre to satisfy the British florist, and none of the chief varieties—so interesting both scientifically and floristically—is mentioned. Nor do we think that Prof. Bailey would concur in the statement with respect to peas (p. 2490): "Left to themselves, the varieties of peas soon lose their characteristics through variation."

Broadly speaking, however, the information provided in the cyclopædia is accurate and comprehensive, and we advise all British horticulturists to provide themselves with a copy. Once they possess it, it will be in constant use.

PRINCIPLES AND METHODS OF SCIENCE TEACHING.

A Text-book in the Principles of Science Teaching. By Prof. G. R. Twiss. Pp. xxvi+486. (New York: The Macmillan Co.; London: Macmillan and Co., Ltd., 1917.) Price 7*s*. 6*d*. net.

THIS book is a treatise on the principles and methods of science teaching in secondary schools, and is intended to serve as a text-book on education in training colleges and as a guide to all who are concerned with science teaching and its organisation. It is a large book of twenty-four compact chapters, each being a veritable mine of information. At the end of each chapter there are valuable lists of reference books and sets of questions for further study, and in the appendices are given a selected list of science books suitable for school libraries, a bibliography for teachers, and a list of scientific periodicals.

In the earlier chapters are set forth the principles which should underlie all science teaching, the meaning of science, the viewpoint of the science teacher, and the educational value of science in discipline and culture. The rest of the book is devoted to the details of the methods of class-teaching in biology, geography, physics, chemistry, and what is known as "general science," and to an elaboration of the design of classrooms and laboratories, with catalogues of furniture, apparatus, and plant.

In his earlier chapters the author emphasises the principles which he holds should form the basis of science teaching. He tells us truly—and it is a fact which, strangely enough, stands more in need of emphasis to-day than at any other time—that "modern science and modern social and industrial life are inseparably linked together, and that each in turn causes the other to advance." There is nothing new in this principle, but its application to education in schools is being rejected, one after another, by educational boards and Government committees the function of which it is to reconstruct education after the war. In America, apparently, the authorities put their faith in the principle. "The science work of the school," says our author, "must be kept in close touch with the doings of everyday life, and especially with the activities that lie nearest to the immediate interests of the boys and girls." This, we believe, is the true democratic principle of edu-

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cation and the mainspring of creative life. At any rate, it is that which the people themselves are asking for, but it is the principle which at the moment is threatened with submersion.

Pure and applied science, the author insists, should not be divorced in the schools, and he has some warnings to give science teachers of the danger of "science laboratory courses," where experiments are mainly designed to verify a law, to demonstrate a fact, to determine the value of a physical constant, or merely to measure something. He is all for allowing theories to wait on practical investigations, and most teachers will now agree.

Two criticisms may be offered. The author, with all his belief in the application of science, does not go the whole way and advocate boldly the teaching of applied science in the school. He would find that such a science course would lead in the early stages at school to the elementary (so-called) scientific theories and to mathematical developments. He seems still content to "illustrate" theory by "practical applications"—which, we submit, is illogical and derogatory. However, the method of illustration is dominant to-day—except where needs must, some science may be taught with a vocational "bias," which seems unnatural, crooked, and non-creative.

Even more serious is the author's silence on what is, after all, the most vital thing in scientific education—the growth and development of the "science outlook" on life—the gospel of science.

AVIATION ENGINES.

Aviation Engines: Design, Construction, Operation, and Repair. By 1st Lieut. V. W. Pagé, Pp. 589. (London: Crosby Lockwood and Son, 1918.) Price 15*s*. net.

THE author expresses the desire in his preface that this book shall prove of use to men in the aviation section of the U.S. Signal Corps and to students who wish to become aviators or aviation mechanicians. The subject is obviously one beset with difficulties and restrictions at the present time; not only is practice changing with bewildering rapidity, but much of the information which it would be most useful to impart it is now impossible to print in any book purchasable by the public. These limitations must in fairness be borne in mind when a book on this subject is reviewed, but there are sections of it to which such considerations do not apply, and which can properly be judged on their merits—as it happens, it is in these sections that the main defects of the book are found to lie.

Lieut. Pagé sets out to provide "a complete practical treatise outlining clearly the elements" of the subject, together with sections on the design, construction, operation, and repair of aviation engines. We do not think, however, that the elements have been either clearly or accurately outlined; on p. 21 work is measured on a time basis, and is identified with power; again, on p. 25, momentum is identified with torque, and on the same page pressure, force, and power are all treated as interchangeable terms. Such confusion must spell disaster to any student desiring to acquire a right knowledge of "the elements," and it is scarcely too much to say that the theoretical section of the book would be best omitted by those who approach the subject for the first time.

The practical part of the book is very much more satisfactory, but overweighted with such irrelevant details as the use and care of files, the use and care of taps and dies, and a section on micrometer calipers and their use. Such details as these are better confined to books on workshop processes, as they are common to all engineering construction. The author has, we notice from certain advertisements included in the volume, already written books—altogether some four or five thousand pages—on such subjects as the modern gasolene automobile; the location of Ford engine troubles made easy; motorcycles, their construction, management, and repair; and like works, and must, we should have thought, have noticed the impossibility of combining reasonable bulk with inclusion of workshop processes. This condition of practical repletion extends also to the discussion, on p. 201, of "why lubrication is necessary," since we find that "proper lubricity of all parts of the mechanism is a very essential factor, upon which the durability and successful operation of the motor-car power plant depends." As this applies equally to the aviation engine (about which the book is written), it is not understood why a reference to the motor-car is required; if this sentence, and certain of its successors, are taken from some book on car engines, it would have been better to edit them in the process.

The book is of interest—and of use—to those who are experienced enough not to be misled by the inexact theory, and can select what is useful from what is not; but as a book for students or young airmen of any sort we much prefer the "Aero-Engines" of Mr. Burls, which is so much in use in our own Flying Service.

H. E. W.

OUR BOOKSHELF.

A Check List of North American Amphibians and Reptiles. By L. Stejneger and T. Barbour. Pp. iv+125. (Cambridge, Mass.: Harvard University Press, 1917.) Price 10*s*. 6*d*. net.

THIS is the third list of the kind issued in America, the earlier being by Cope (1875) and by Yarrow (1882). In the meantime, two monographs have been published by the Smithsonian Institution, viz. Cope's "North American Batrachia" (1889) and the same author's "Crocodilians, Lizards, and Snakes of North America" (1900), which, as Dr. Barbour observes in the Introduction, "are frequently erratic and inaccurate." There was great need of a fresh stock-taking of this rich herpetological fauna, so many striking forms having been added since the publication of Cope's monographs, such as, for instance, *Typhlomolge rathbuni* (Texas), *Ranodon olympicus* (Washington), *Batrachoseps*

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